

## Reason for Monitoring

- Over 700 spills have been documented along the St. Clair River System since 1986.
- Two of the most notable spills:
  - 8-14-2003 spill of 134 kg of vinyl chloride.
  - 2-1-2004 (Super Bowl Spill) of 42,000 gallons of methyl ethyl ketone.
- A estimated 4.2 million people on the U.S. side receive their drinking water from the Huron to Erie waterway.

## Existing Notification Process

### Spill and Emergency Reporting Agencies

- Michigan State Police
- Ontario Spills Action Centre (Toronto)
- Pollution Emergency Alerting System (MDEQ PEAS system)
- MDEQ SE Michigan District Staff
- Drinking Water Treatment Plant Staff

## Multiple Tasks

- Provide instant notification of contamination at a WTP intake
- Protect against CBRNE threat
- Provide ambient water quality information at each intake for treatment purposes
- Provide data to improve modeling of the HEC waterway
- Improve decision making during spill events

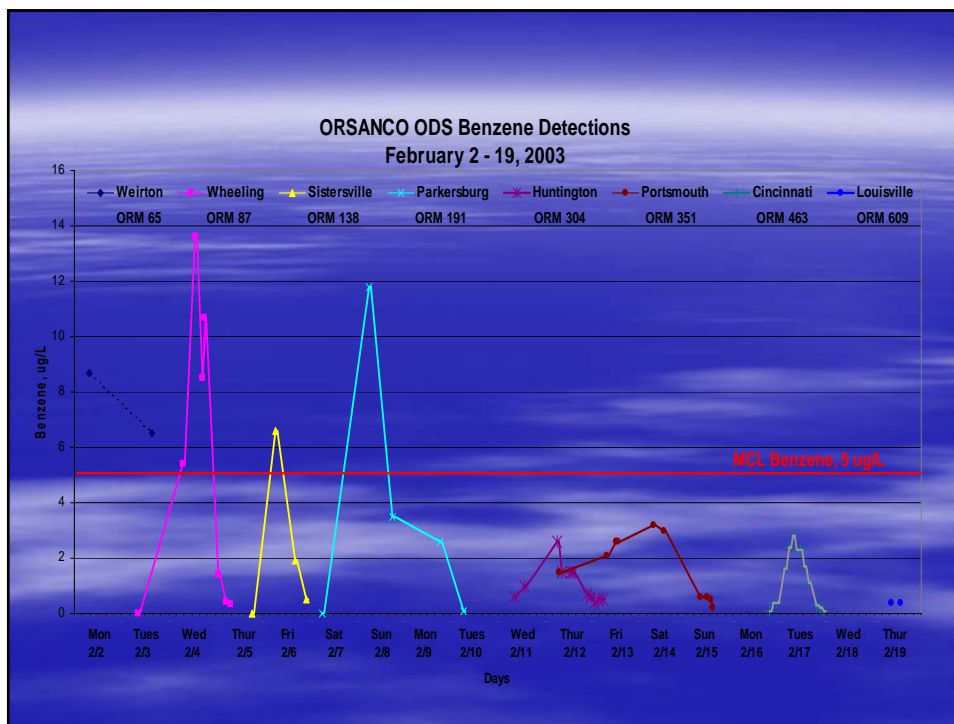
## Primary Goals and Objectives

Establish a monitoring network along the St. Clair River, Lake St. Clair and Detroit River to protect the drinking water supply

- Install monitoring equipment at WTP intakes
- Analyze water quality every 15 - 30 minutes
- Share data (real-time) from the entire network with each WTP
- Institute a water quality alarm notification system

## Existing Monitoring Systems

- ORSANCO – Ohio River Valley Water Sanitation Commission
  - The oldest and most well established system
- AMWEDS - Allegheny and Monongahela River early warning system
  - Temporarily out of service due to lack of funding
- Lower Mississippi River early warning system
- Delaware Valley early warning system
- Upper Mississippi River early warning system
- Susquehanna River early warning system





## Funding Sources

- EPA grant with match
  - St. Clair River and Upper Lake St. Clair communities
  - Macomb (and St. Clair) County Health Dept. grant fiduciary
  - State funding through the Lake St Clair Regional Monitoring Program
- Department of Homeland Security grant (FY 05)
  - Urban Area Security Initiative (UASI)
  - Wayne County communities
  - Administered by Michigan State Police through the MDEQ
- State MDEQ Grant
  - Water Bureau Settlement Funds
  - \$250,000 for 2006, 2007 and beyond (??)

## Develop Early Warning Water Quality Monitoring Network

- Conduct suitability and susceptibility analysis to determine threats and resources
- Identify on-line monitoring equipment
  - GC/MS
  - Fluorometer
  - Total Organic Carbon Analyzer
  - Multiparameter probe
- Rapid Toxicity System - Distribution
  - Microtox



## YSI Multiparameter Sonde

- pH
- Temperature
- Conductivity
- Dissolved Oxygen
- Oxidation/Reduction Potential
- Turbidity
- Chlorophyll a





## Fluorometer Flow Cell

TURNER DESIGNS TD-400

### NON-CONTACT, NON-FOULING FLOW CELL

**NON-CONTACT, NON-FOULING FLOW CELL**  
The TD-400 flows and has a glass flow cell. Anomalous luminescence is detected in a stream of water which flows through an open channel; the stream does not contact, dirty or foul the optical modules used for monitoring anomalous hydrocarbon flow. Anomalous flow detection system keeps optical windows free from fouling and maintains or for water applications.

**LOW MAINTENANCE**  
There are no valves, pumps or valves to replace. The optical flow sensing part has a life expectancy of greater than 5 years. Routine maintenance involves changing a lamp twice a year and an air filter periodically.

**DIRECT, CONTINUOUS MONITORING**  
The TD-400 monitors a flowing water stream continuously. No chemicals, no pretreatment and no manual manipulation of the sample are required to monitor anomalous hydrocarbons.

**ACCURATE**  
The TD-400 directly measures anomalous hydrocarbons in water with accuracy that consistently exceeds the regulated laboratory methods.

### HIGH SENSITIVITY AND SELECTIVITY

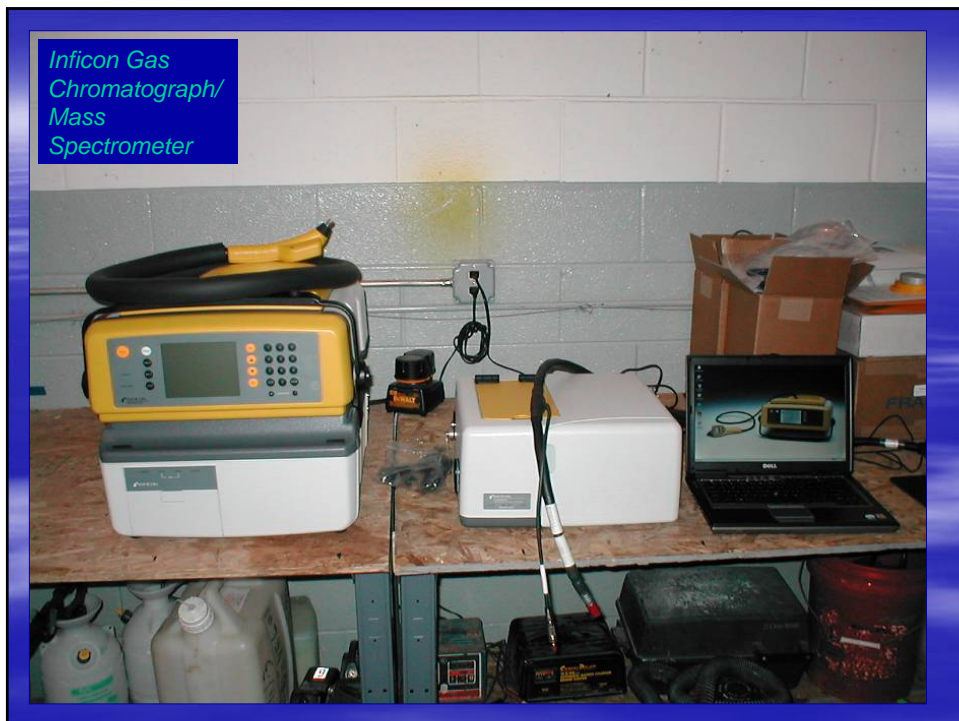
**SENSITIVE**  
RTLS, sensitive, direct, for both crude oil, aromatic, aromatic and diesel petroleum products containing aromatic are detected by the TD-400 flow cell. For example, the TD-400 can detect 1 ppb of gasoline or diesel fuel in water free of interfering compounds.

**SELECTIVE**  
The TD-400 continuously measures the fluorescence of aromatic hydrocarbon compounds in water. Fluorescence occurs when a molecule absorbs light energy at one specific wavelength and emits light energy at a longer wavelength. Fluorescent compounds each have a unique signature, and these compounds can be displayed as an actual concentration.

**EFFECTIVE MONITORING IN DIRTY WATER**  
Fluorescence technology makes the TD-400 resistant to interference by turbid or dirty water which impact on the UV or IR absorption instruments. Most substances absorb light, but very few fluoresce; if a substance does not fluoresce at the specific wavelength for the monitored aromatic hydrocarbon, it will not interfere.

**OPERATOR FRIENDLY**  
The TD-400 is designed for easy operation. Simple on-board software controls display, 800 mA output, diagnostics and calibration.





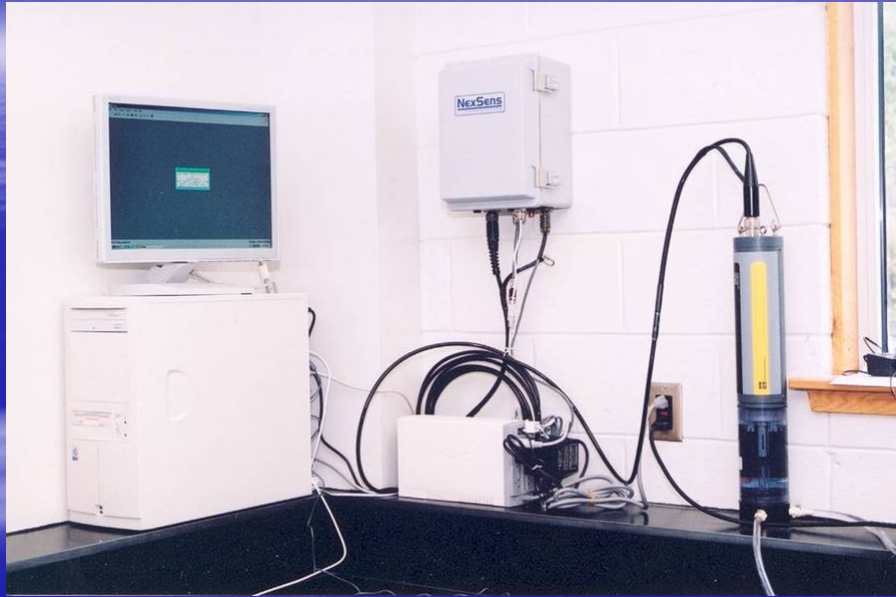
## GC/MS

Compound	Target Concentration (mg/L)
*Benzene	0.005
*m, o, p -Xylene	3.33
Chloroform	0.08
Carbon tetrachloride	0.005
Tetrachloroethene	0.005
1,1,1-Trichloroethane	0.2
1,1,2-Trichloroethane	0.005
Styrene	0.1
1,2-Dichloropropane	0.005
Methylene chloride	0.005
Chlorobenzene	0.1
Ethylene dibromide	0.00005
*Toluene	1

## GC/MS

Compound	Target Concentration (mg/L)
1,2-Dibromo-3-chloropropane	0.0002
MTBE	0.04
Hexane	3
Cyclohexane	3
Trichloroethene	0.005
Acrylonitrile	0.0026
1,1-Dichloroethene	0.007
*1,2-Dichloroethane	0.005
*Vinyl chloride	0.002
Ethyl benzene	0.7
1,2 & 1,4-Dichlorobenzene	0.6 & 0.075
cis & trans -1,2-Dichloroethene	0.07 & 0.1

### Data Logger with YSI probe

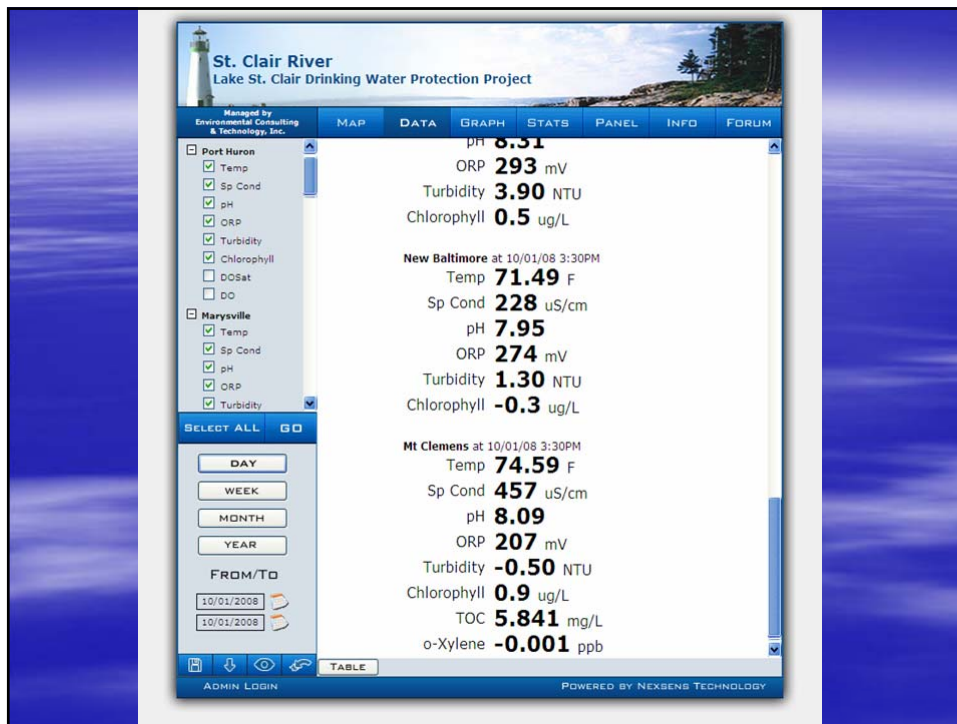


## Data Management and Dissemination

- Data storage on an off-site project server
- Data shared between the WTPs through a password protected website
- Data visualization using NexSens iChart software



Data transfer to a public website



## Notification System

- Develop the Spill Notification Protocol
  - Email?
  - Internet based server alarm?
  - Text message?
- Determine alarm settings/conditions for each parameter
  - MCL or Health Advisory? (> 90% of MCL)
  - Method Detection Limit? (> 10% of MCL)
  - Established normal QA/QC chart values? (> 50% of MCL)
- Determine WTP response and corrective actions
- Conduct spill drills to test the system



Not in Real Time but Really Important

## Microtox

Biosensor based toxicity assessment



## Other Applications

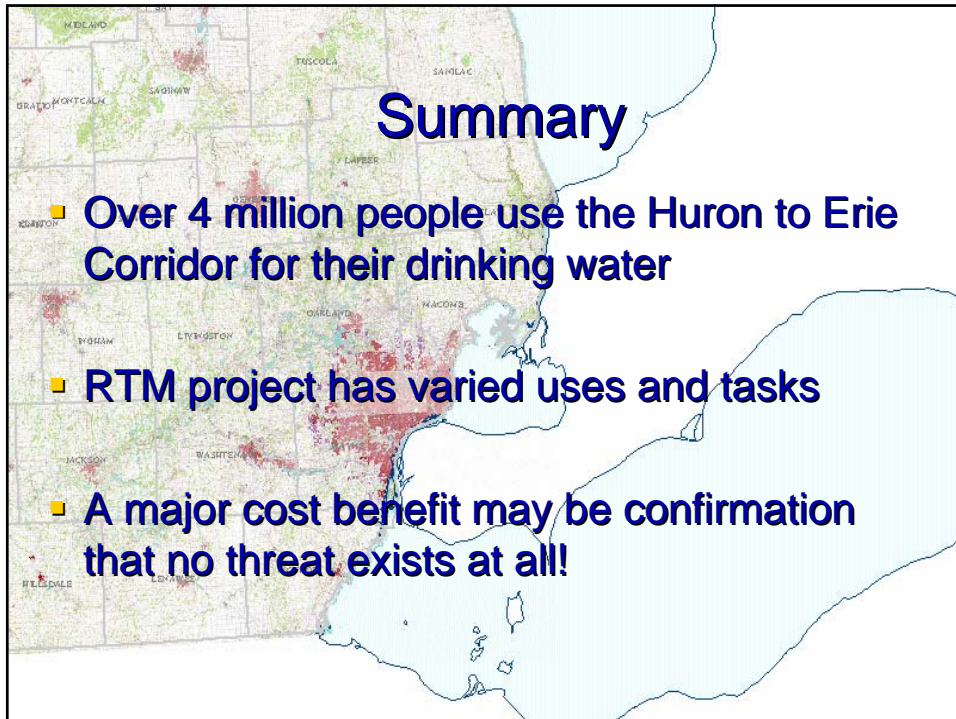
- USGS dimensional models for the St. Clair River and Lake St. Clair
- Controlled Chemical Applications
  - USFWS Lampricide Program
  - MDEQ Aquatic Nuisance Program

# Vicinity Map

The map displays the Lake Erie region with various locations and water intakes. Key locations include Marysville, St. Clair, Marine City, Port Lambton, and various water intakes (PWI) such as Marysville PWI, St. Clair PWI, Marine City PWI, and Ira Twsp PWI. The map also shows the Lake Erie shoreline and surrounding areas like New Baltimore and New Baltimore.

Particles expected to pass an area near the Village of St. Clair WTP intake about 4 hours after release.

The map shows a section of the St. Clair River. A grid is overlaid on the river area. A red line indicates the expected path of particles. The path starts near the top left, moves down the river, and then turns right towards the bottom right. The path is marked with red dots and lines. The map includes labels for 'ST. CLAIR', 'COURTHOUSE', and 'ST. CLAIR WTP'. A scale bar at the top indicates a distance of 4.00. The map is dated 1/14/2000 and has a file number 490106.01.

A map of Michigan with the Huron to Erie Corridor highlighted in red. The corridor runs from the western shore of Lake Huron, through the central part of the state, to the eastern shore of Lake Erie. Major cities like Grand Rapids, Lansing, and East Lansing are visible along the corridor. The word "Summary" is written in large blue letters in the upper right corner of the map area.

## Summary

- Over 4 million people use the Huron to Erie Corridor for their drinking water
- RTM project has varied uses and tasks
- A major cost benefit may be confirmation that no threat exists at all!

A cartoon illustration of a man in a grey suit, white shirt, and red tie. He has glasses and his arms are outstretched in a questioning or explanatory gesture. There are small lines above his head indicating surprise or emphasis.

## Questions?

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State of Michigan  
**DEQ**  
Department of Environmental Quality